Steam Electric Effluent Limitations Guidelines (ELGs)

March 13, 2017

Overview & Background

What are ELGs?

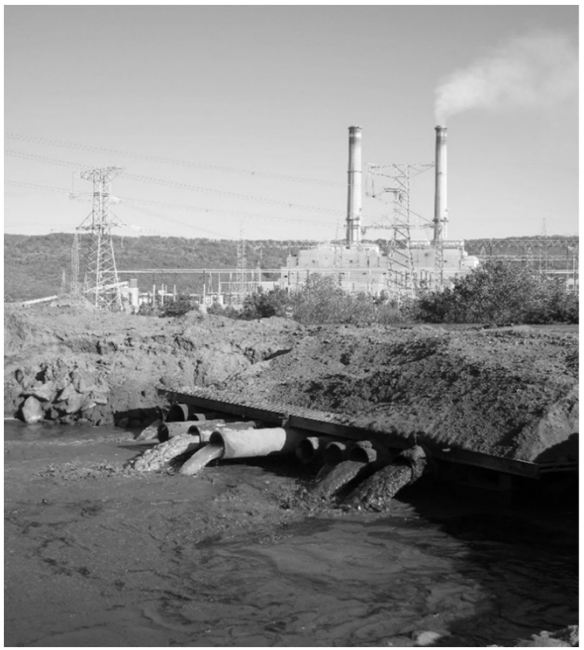
- The Clean Water Act directs EPA to establish ELGs to control discharges of pollutants in industrial wastewater to surface waters and publically owned treatment plants (POTWs).
  - Intended to represent the minimum level of pollution control for pollutants in industrial wastewater discharges.
- ELGs are based on the performance of specified technologies; facilities are not required to use those technologies and may instead use alternative technologies/approaches to comply.
  - Statute designed to increasingly elevate the technology floor for all dischargers in an industrial sector to match the performance of the best plants in the industry.
  - "Technology" includes in-plant or end-of-pipe treatment, process changes, pollution prevention, wastewater minimization and best management practices.
  - Not based on the quality of individual receiving waters.
- ELGs provide equity and certainty for industrial facilities.
  - Apply to all facilities as defined in the regulation throughout the country within the industry sector (national in scope).
  - In the absence of national ELGs, a permitting authority conducts a site-specific assessment and determination of technology based limits, and re-visits that determination every 5 year permit cycle.

What is the Steam Electric Rule?

- These ELGs are applicable to discharges from fossil- and nuclear-fueled steam electric generating units at establishments where the generation of electricity is the predominant source of revenue or principle reason for operation.
- EPA signed revisions to the ELGs on September 30, 2015 to strengthen controls on certain discharges from steam electric power plants.
- (b) (5) [redacted]
  - EPA collected detailed plant level data from every coal-fired and many other steam electric plants to inform this rule.
  - This plant-specific data enabled EPA to evaluate feasibility, costs, and economic achievability of various technological approaches for each plant.
  - The record demonstrates the requirements are available, achievable, and affordable as required by the Clean Water Act.

Steam Electric Discharges

- Steam electric power plants discharge large volumes of wastewater with vast quantities of pollutants, including toxics such as arsenic (As), lead (Pb), mercury (Hg), selenium (Se), chromium (Cr), cadmium (Cd), as well as nutrients.
- Steam electric power plants are the largest industrial source of toxic pollutants discharged to surface waters, responsible for approximately 30% of the nationwide total.
- By updating regulations for this industry that were more than 35 years old, the rule established the first set of national limits on toxic pollutants for the largest wastewater sources at power plants.



Rule Revisions Were Long Overdue

- ELGs hadn't been updated since 1982. After being sued for failing to revise the effluent guidelines, EPA entered a consent decree pursuant to which EPA signed a notice of proposed rulemaking and, after taking public comments, signed a notice taking final action in September 2015.
- Previous regulations did not reflect widely used treatment technologies & processes, and did not address toxic discharges in any meaningful way (based on settling ponds).
- Many permits being issued lacking water quality-based effluent limits, even to impaired waters, and without case-by-case technology-based limits on toxics.

Coal Ash Pond

What Does the Rule Accomplish?

- Reduces pollutant discharges by 1.4 billion pounds annually.
  - Removes 99% of the mercury, 97% of the arsenic, and 98% of the selenium that would otherwise be discharged.
- Reduces water withdrawals by 57 billion gallons annually.
- Large reductions in state water quality criteria exceedances.
- Significant improvements in aquatic species habitats and fisheries.
- Reduces eutrophication, improving the quality and value of water-based recreation and drinking water.
- Improves protections for downstream drinking water plants and their customers.

Steam Electric Discharges: Public Health Impacts

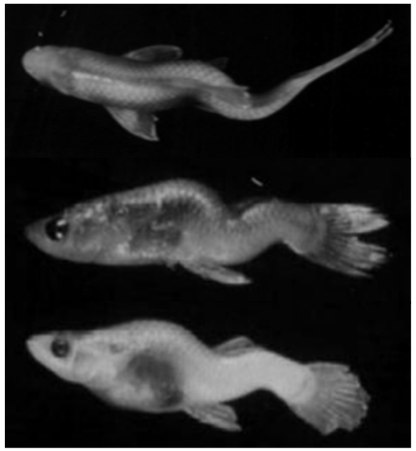
- Lowered IQs in children exposed to mercury & lead.
- Cancers & other adverse health effects (*e.g.*, cardiovascular, pulmonary & neurological disorders) from exposure to arsenic.
- Cardiovascular disease and damage to kidney, liver & circulatory systems from exposure to lead & selenium.
- Hazardous algal blooms from nitrogen discharges.
- Power plant discharges are in close proximity to >100 public drinking water intakes & nearly 2,000 public wells.
- Risk of catastrophic failure of impoundments (*e.g.*, 2008 TVA spill).
- Minority & low-income communities have greater exposure than the general public to pollutants from power plants, due to their closer proximity to the discharges and greater consumption of fish from contaminated waters.

Fishing near power plant discharge outfall

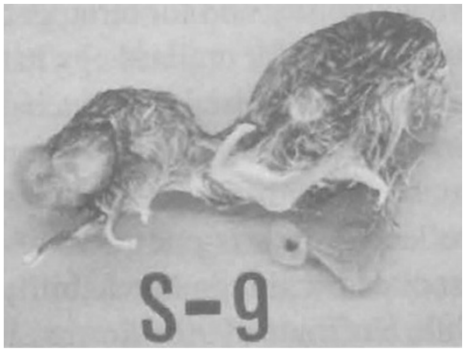
TVA Kingston spill (2008)

Steam Electric Discharges: Ecological Impacts

- Mercury, selenium, and many of the other toxic pollutants bioaccumulate in fish and wildlife, and remain in the sediment of lakes and reservoirs for decades.
- Consumption of high levels of selenium cause reproductive impairment and deformities in fish and waterfowl.
- Discharges of nitrogen and phosphorus exacerbate over-enrichment and associated water quality problems.
- Impoundments are attractive nuisances for wildlife.



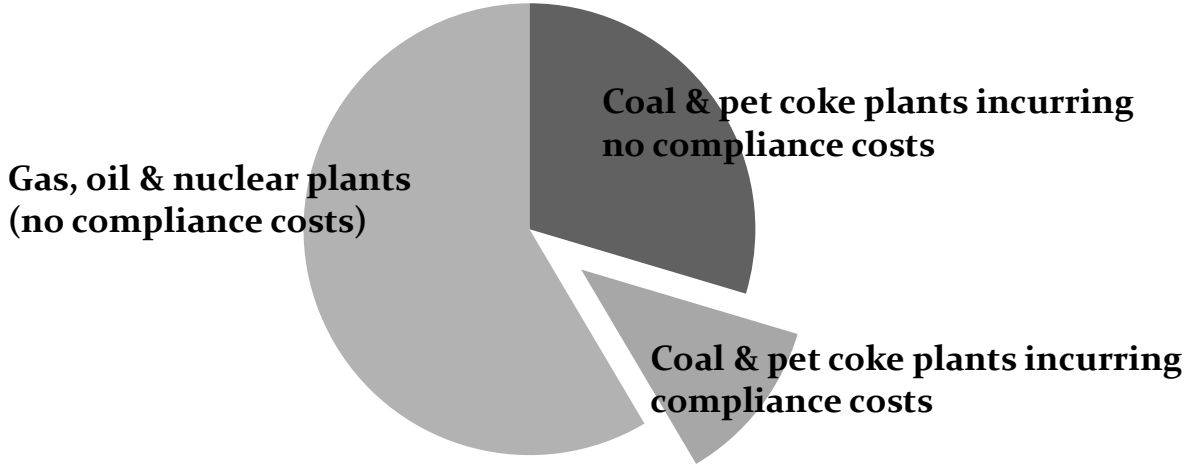
Deformed fish and bird embryo due to selenium exposure



Overview of the ELG Requirements

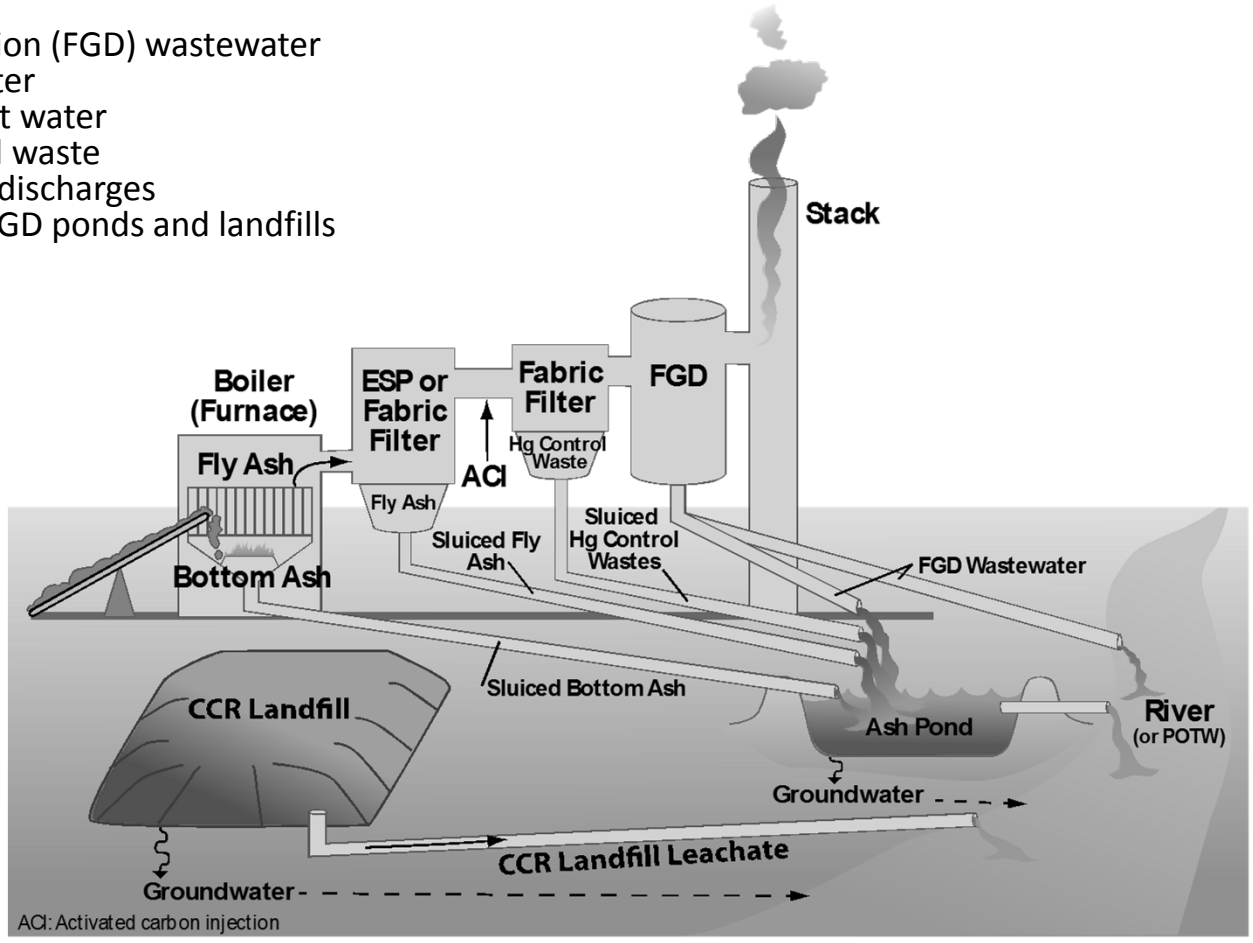
Who is Affected by the Revised ELGs?

- Only a small fraction (12%) of the ~1,000 steam electric plants will need to make new investments to meet the rule's requirements.
- No new effluent limitations for natural gas or nuclear units, nor for any existing oil-fired units or "small" generating units (≤50 MW).
- Most coal-fired plants already operate in a manner that meets the new requirements.



Wastestreams Addressed by the Rule

- Flue gas desulfurization (FGD) wastewater
- Fly ash transport water
- Bottom ash transport water
- Mercury (Hg) control waste
- Gasification process discharges
- Leachate from ash/FGD ponds and landfills



Fly Ash Transport Water

- Established a “zero discharge” limit, based on converting wet ash handling system to dry pneumatic system.
- Dry ash handling promotes beneficial uses of coal combustion residuals, such as use as a preferred feedstock for wallboard and cement.
- Shifting away from disposing of fly ash in ponds reduces the risk associated with groundwater contamination and structural failure of ponds.
- When the rule was signed, dry ash handling was widely demonstrated, with over 80 percent of generating units operating these systems; others had announced plans to convert the systems at additional generating units.
- Now, the transformation to dry ash handling systems is nearly complete, with only a handful of plants still using wet ash handling systems.

Bottom Ash Transport Water

- Established a "zero discharge" limit, based on converting to a dry ash handling system or creating a closed-loop process that recycles the ash wastewater.
- Promotes beneficial use of coal combustion residuals.
- When the rule was signed, more than 50% of plants already employed zero discharge technologies or had announced plans to switch to such system in the near future.
- Now, companies are moving rapidly to transform their entire fleet of power plants (for example, Duke Energy, American Electric Power, and Tennessee Valley Authority).
- Plants are making wise investments as they follow the lead of European and Asian power companies by embracing the bottom ash technologies that improve the energy efficiency of the boilers. Modifying the boiler with completely dry bottom ash systems increases the boiler's energy efficiency by reducing the amount of coal burned per MW of electricity generated.

Flue Gas Desulfurization (FGD) Wastewater

- Effluent limits for arsenic, mercury, selenium and nitrate/nitrite
  - The limitations were based on extensive data from power plants using chemical precipitation and biological treatment systems.
- The rule also established an alternative set of effluent limits, for power plants that opt into a Voluntary Incentives Program
  - Effluent limits on Hg, As, Se, and total dissolved solids (TDS) based on the most effective technology: evaporation.
  - Addresses certain pollutants not removed by chemical and biological treatment technologies (*e.g.*, bromides, boron).
- When the rule was signed, nearly half of all power plants with wet scrubbers already had equipment/processes in place that would enable them to meet the new effluent limits.
- A number of power plants are "leapfrogging" past the performance level set by the new BAT effluent limitations.
  - Possibly driven by power plant concerns that widespread use of bromide additives to control air emissions will trigger adverse impacts on downstream drinking water plants.
- The new BAT limits have spurred technology development and new technology vendors entering the market resulting in new technology solutions capable of meeting the BAT and Voluntary Program effluent limits.

Legacy Wastewater

- Legacy wastewater is fly ash transport wastewater, bottom ash transport water, and FGD wastewater contained in ponds that was generated prior to the date at which the new limits (described previously) take effect.
- For legacy wastewater, the rule established limits for total suspended solids (TSS) based on settling ponds (equal to existing BPT limits) due to a lack of performance data from more advanced treatment technologies.
- Post-rule information demonstrates that power plants have increased the pace at which they are dewatering and closing their ponds and the use of advanced technologies (chemical precipitation and/or biological treatment) for treating this discharge; (b) (5) [redacted]

Other Wastestreams

- Combustion residual leachate from landfills & surface impoundments
  - limits for TSS based on settling (equal to existing BPT limits).
- Flue gas mercury control wastewater (from activated carbon injection)
  - "Zero discharge" limit based on dry handling system.
  - Matches current industry practice.
- Gasification wastewater
  - Limits on Hg, As, Se, and TDS based on evaporation.
  - Matches current industry practice.